

REMARKS

Claims 1-19 are pending in the present application. Claims 1 and 3-10 are herein amended. Claims 11-19 are newly added. No new matter has been entered.

The invention of the present application relates to a process for preparing a vinyl chloride copolymer resin by copolymerizing a vinyl chloride type monomer and a macromonomer having a polymer comprising an ethylenically unsaturated monomer containing a double bond in a main chain and is characterized in that the vinyl chloride type monomer and the above-noted macromonomer are previously dispersed and mixed in the temperature range from 20°C to 60°C for at least 1 minute, and then copolymerization reaction is initiated.

In the present claims, the phrase "dispersed and mixed" is meant to indicate that both the vinyl chloride type monomer and the macromonomer are uniformly mixed together with no interface therebetween and, as a result, the two cannot be apparently differentiated from each other. (See specification, page 15, line 26 to page 16, line 4.) The phrase "previously dispersed and mixed" is meant to indicate that a vinyl chloride type monomer and a macromonomer are dispersed and mixed before feeding suspension dispersant, polymerization initiator, water, *etc.* (See specification, page 16, lines 5-14.) As demonstrated in the Examples of the present specification, the vinyl chloride type monomer and the macromonomer are previously dispersed and mixed under the specific conditions recited in the claims, and then polymerization initiator, an aqueous solution of dispersant, *etc.*, are fed so as to carry out suspension polymerization or micro suspension polymerization.

By uniformly dispersing and mixing a macromonomer in a vinyl chloride type monomer before adding suspension dispersant, *etc.*, to carry out copolymerization reaction as described

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above, it is possible to produce a remarkable effect of improved polymerization stability. The specification describes that the following problems are inhibited: (1) the inability to form normal particles because of abnormal copolymerization; (2) the removal of the polymerization heat is unsatisfactory even when copolymerization is not abnormal; and (3) the formation of scales even when normal particles are obtained. (*See* specification, page 18, lines 3-12.)

Furthermore, by controlling the temperature at which the above-described dispersing and mixing are carried out to 20°C to 60°C, it is possible to carry out uniform dispersing and mixing while a suitable pressure in the dispersing-and-mixing tank can be maintained. (*See* specification, page 15, lines 7-16.) The following comparisons demonstrate that although the temperature for dispersing and mixing within the range of the present application achieves favorable polymerization stability, a temperature for dispersing and mixing below 20°C results in lower polymerization stability so that unmixed macromonomer exists on the inner wall of the polymerization reactor and in the slurry: Example 2 compared with Comparative Example 2; Example 3 compared with Comparative Example 4; Example 5 compared with Comparative Example 7; Example 6 compared with Comparative Example 9; Example 8 compared with Comparative Example 12; and Example 9 compared with Comparative Example 14.

With regard to the mixing time, the time of at least 1 minute may be enough for the uniform dispersion and mixing of a macromonomer in a vinyl chloride type monomer. (*See* specification, page 15, lines 17-25.) The following comparisons demonstrate that although the mixing time for dispersing and mixing of at least 1 minute achieves favorable polymerization stability, a mixing time of shorter than 1 minute results in lower polymerization stability so that unmixed macromonomer exists on the inner wall of the polymerization reactor and in the slurry:

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Example 2 compared with Comparative Example 3; Example 3 compared with Comparative Example 5; Example 5 compared with Comparative Example 8; Example 6 compared with Comparative Example 10; Example 8 compared with Comparative Example 13; Example 9 compared with Comparative Example 15.

Claim Rejections - 35 U.S.C. § 103

A. JP 3-24105 in view of Kitamura

Claims 1-8 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 3-24105 (JP '105) in view of **Kitamura** (US 5,292,836). Favorable reconsideration is requested.

Applicants respectfully submit that JP '105 in view of Kitamura does not teach or suggest:

wherein the vinyl chloride type monomer and the macromonomer having a polymer comprising an ethylenically unsaturated monomer containing a double bond in a main chain are previously dispersed and mixed at a temperature from 20°C to 60°C for at least 1 minute so as to obtain a mixture solution, and copolymerization reaction of the mixture solution is carried out

as recited in amended claim 1, and that this feature would not have been obvious.

JP '105 discloses that a vinyl chloride resin obtained by copolymerizing a vinyl chloride monomer and a polystyrene macromonomer is produced by, for example, suspension polymerization. However, with regard to its polymerization process, JP '105 only mentions that the vinyl chloride monomer, the macromonomer, ion exchange water, polymerization initiator, suspension dispersant, *etc.*, are supplied to a polymerization vessel and allowed to react. JP '105 does not teach or suggest that the vinyl chloride type monomer and the macromonomer are

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previously dispersed and mixed in a temperature range from 20°C to 60°C for at least 1 minute and then copolymerization reaction thereof is initiated as recited in amended claim 1.

The Office Action cites Kitamura for disclosing a delayed polymerization process.
(Office Action, page 2.)

Kitamura discloses subjecting an aqueous medium containing vinyl monomer, a polymerization initiator and a dispersant to high-speed shear agitation to prepare a suspended dispersion containing fine particles of the monomer dispersed therein, then subjecting the suspended dispersion to low-speed shearing, and thereafter starting suspension polymerization. Kitamura may disclose that the polymerization is delayed in order to mix the medium. However, Kitamura neither mentions nor suggests that the vinyl chloride type monomer and a macromonomer are previously dispersed and mixed under the specific conditions and then initiating polymerization as recited in claim 1. As stated above, “previously dispersed and mixed” is meant to indicate that a vinyl chloride type monomer and a macromonomer are dispersed and mixed before feeding suspension dispersant, polymerization initiator, water, *etc.* (See specification, page 16, lines 5-14.) In Kitamura, the polymerization is delayed in the state of the suspended dispersion containing the monomer, water and the dispersant, and it is not mentioned that the vinyl chloride type monomer and a macromonomer are “previously dispersed and mixed” as recited in amended claim 1. Furthermore, the co-monomer copolymerizable with the vinyl chloride monomer in Kitamura is not a macromonomer, and thus, it would not need to be “previously dispersed and mixed.”

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Therefore, JP '105 in view of Kitamura does not teach or suggest previously dispersing and mixing a vinyl chloride type monomer and a macromonomer, and this feature would not have been obvious.

B. Grauer in view of Kitamura

Claims 1-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Grauer** (US 5,314,966) in view of **Kitamura**. Favorable reconsideration is requested.

Applicants respectfully submit that Grauer in view of Kitamura does not teach or suggest:

wherein the vinyl chloride type monomer and the macromonomer having a polymer comprising an ethylenically unsaturated monomer containing a double bond in a main chain are previously dispersed and mixed at a temperature from 20°C to 60°C for at least 1 minute so as to obtain a mixture solution, and copolymerization reaction of the mixture solution is carried out

as recited in amended claim 1, and that this feature would not have been obvious.

Grauer discloses preparing a finely divided vinyl chloride graft copolymer by a suspension polymerization process, and using acrylate having 2 to 12 carbon atoms for polymerization. However, Grauer does not disclose the use of a macromonomer and Grauer does not disclose that the vinyl chloride type monomer and a macromonomer are "previously dispersed and mixed" as recited in amended claim 1.

The Office Action cites Kitamura for disclosing a delayed polymerization process.
(Office Action, page 3.)

As stated above, in Kitamura, the polymerization is delayed in the state of the suspended dispersion containing the monomer, water and the dispersant, and it is not mentioned that the

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vinyl chloride type monomer and a macromonomer are “previously dispersed and mixed” as recited in amended claim 1, and the co-monomer copolymerizable with the vinyl chloride monomer in Kitamura is not a macromonomer, and thus, it would not need to be “previously dispersed and mixed.”

Therefore, Grauer in view of Kitamura does not teach or suggest previously dispersing and mixing a vinyl chloride type monomer and a macromonomer, and this feature would not have been obvious.

New Claims

Claims 11-19 recite that the macromonomer has a number average molecular weight ranging from 500 to 100,000 and a ratio of weight average molecular weight to number average molecular weight of smaller than 1.8. (*See, e.g.*, specification pages 7-9.) The macromonomer used in the present invention is prepared by a special polymerization process called living radical polymerization. This macromonomer having a narrow molecular weight distribution and a low viscosity achieves an excellent effect in which a specific functional group can be introduced into almost any position. Applicants respectfully submit that the references do not teach or suggest this feature.

For at least the foregoing reasons, claims 1-19 are patentable over the cited references. Accordingly, withdrawal of the rejections of claims 1-10 is hereby solicited.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

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If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP



Andrew G. Melick
Attorney for Applicants
Registration No. 56,868
Telephone: (202) 822-1100
Facsimile: (202) 822-1111

AGM/adp